

2014

## Evaluating Approaches to Measuring Ocular Pain in Bovine Calves with Corneal Scarification and IBK-Associated Corneal Ulcerations

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### Recommended Citation

Dewell, Reneé; Millman, Suzanne T.; Gould, Stacie A.; Tofflemire, Kyle L.; Whitley, R. David; Parsons, Rebecca L.; Lowe, Eric W.; Liu, FangFang; Wang, Chong; and O'Connor, Annette (2014) "Evaluating Approaches to Measuring Ocular Pain in Bovine Calves with Corneal Scarification and IBK-Associated Corneal Ulcerations," *Animal Industry Report*: AS 660, ASL R2837.

DOI: [https://doi.org/10.31274/ans\\_air-180814-1123](https://doi.org/10.31274/ans_air-180814-1123)

Available at: [https://lib.dr.iastate.edu/ans\\_air/vol660/iss1/2](https://lib.dr.iastate.edu/ans_air/vol660/iss1/2)

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# Evaluating Approaches to Measuring Ocular Pain in Bovine Calves with Corneal Scarification and IBK-Associated Corneal Ulcerations

## A.S. Leaflet R2837

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## Summary and Implications

The objective of this experiment was to describe the magnitude and variation of measures of ocular pain in cattle experiencing corneal scarification and corneal ulcerations associated with experimentally induced IBK. In our study, pressure algometry may be appropriate to quantify ocular pain in calves. This information will enable appropriate design of studies for assessing the extent of ocular pain associated with ophthalmic abnormalities in cattle and efficacy of pain mitigation strategies.

## Introduction

Infectious bovine keratoconjunctivitis (IBK) is a common disease in cattle. The absence of evaluated methods for quantifying ocular pain in cattle present

challenges in assessing pain mitigation strategies for IBK. The objective of this study was to evaluate approaches to measuring pain in bovine calves with corneal scarification and corneal ulcers. We hypothesized that eyes that had been scarified or had corneal ulcerations consistent with IBK would be more painful compared to normal eyes.

## Materials and Methods

To assess this hypothesis, we used mechanical nociceptive thresholds obtained through pressure algometry (PA-MNT), corneal touch thresholds (CTT) obtained through the use of a Cochet-Bonnet aesthesiometer, and assessment for the presence of blepharospasm and photophobia as metrics for pain. Using a one-eye randomized controlled challenge trial, thirty-one calves with healthy eyes were randomly allocated to treatment group, then a left or right eye was randomly assigned for corneal scarification and inoculation with *M. bovoculi* or *M. bovis*.

## Results and Discussion

At the eye-level within calf, there were no differences in PA-MNT or CTT. However, at the calf level lower PA-MNT scores, but not CTT scores, were observed on Day One (post-scarification) relative to baseline (Day-4) (pre-scarification). Corneal ulcerations consistent with IBK were not associated with statistically significant differences in PA-MNT or CTT at eye or calf levels. However, eyes with corneal ulcerations were more likely to exhibit blepharospasm and photophobia compared to healthy eyes. Pressure algometry may be an appropriate approach to quantifying ocular pain in calves. Repeated use of the Cochet-Bonnet aesthesiometer to obtain changes in CTT over time was not a practical technique for calves with corneal ulcerations.

## Acknowledgements

This research was supported by a grant from the Iowa Healthy Livestock Advisory Council. The authors thank Liza Hendricks, Larry Sadler, and Paige Baltzell for valuable technical assistance during the trials.

### Algometry landmarks.



Landmark 1- the juncture of the dorsal bony orbit and the projection of the calvarium.  
Landmark 2- the notch formed by the frontal and temporal processes of the zygomatic bone.  
Landmark 3- 1 cm rostral to the medial canthus of the eye.  
Landmark 4 (control) – on the face midway between the eyes.



Corneal touch threshold (CTT) was measured for each eye using a Cochet-Bonnet aesthesiometer which included a nylon filament ranging from five to 60 mm. Beginning with a 60mm filament length, the eye was touched up to five times and the filament length was subsequently shortened by 5 mm increments until a blink reflex was elicited in three out of five applications.